APPENDIX D
COST ESTIMATE

This appendix provides discussion and supporting information for the DS-7 semi-passive biological treatment system cost estimate. The cost estimate was developed based on available cost information from the pilot study and sources including cost literature, vendor costs, and professional judgement. The cost estimate was prepared consistent with procedures in the G*uide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA, 2000) and is expected to result in estimates that are within a range of -30 percent to +50 percent of actual costs. The estimate includes capital costs and annual operations and maintenance (O&M) costs. These cost categories are described below.

D.1 Capital Costs

Capital costs are those expenditures that are required to design and construct a full-scale semi-passive system, and exclude costs required to operate or maintain the system. Capital costs include all labor, equipment, and material costs associated with activities such as mobilization/demobilization; site work; and installation of the semi-passive treatment system. Capital costs also include expenditures for professional and technical services necessary to support construction of the system.

Construction-related indirect costs and contingencies are estimated as a percentage of capital costs. For this report, adjustments were made to reflect Site-specific costs because much of the design and construction work would be performed by Simplot using equipment and materials present at the Mine and will not require outside contractors.

D.2 Annual O&M Costs

Operation and maintenance (O&M) costs are those post-construction costs necessary to ensure or verify the continued effectiveness of the semi-passive treatment system. These costs are estimated on an annual basis. Annual O&M costs include all labor, equipment, and material costs associated with activities such as monitoring, periodic inspections, and addition of nutrient

amendments and zero-valent iron. Annual O&M costs also include expenditures for professional/technical services necessary to support O&M activities.

For cost estimation, O&M activities are assumed to occur each year over a 30-year period. The cost for inspections is factored into the time for visits to the system to add the nutrient amendments. Frequency of sampling and nutrient amendment addition is based on the information collected during the pilot study.

D.3 Cost Estimates

The cost estimate for the full-scale, semi-passive treatment system is presented in Table D-1. Assumptions used to estimate the capital cost of the treatment system include the following:

- The full-scale treatment system will be sized to treat 6 gallons per minute (gpm).
- The purpose of the inlet tank is to screen out debris, and provide homogenization prior to the treatment vessels. A 2,000 gallon tank will be sufficient for this task.
- In the event of high flows, excess water will be routed around the treatment system via a surface, bypass ditch.
- One influent and one effluent monitoring manhole will be sufficient for access.
- The pilot scale study consisted of two 2,000 gallon tanks in series to treat 1 gpm. The full-scale system is assumed to consist of 6 treatment trains in parallel, each with 2 tanks in series as for the pilot study. This layout would allow an individual train to be closed off from the rest of the system for cleaning or other maintenance as needed. The total system would include twelve 2,000 gal tanks, each with a prefabricated manhole.
- Existing equipment from the pilot study could be repurposed for the full-scale system; however, the cost estimate does not assume use of existing equipment but provides estimates for all equipment needed.
- It was assumed that construction activities could be completed within 3 weeks.
- Information from equipment vendors is used where possible. Remaining costs are supplied from 2014 RSMeans Cost Data (Fortier [editor] 2013) and are adjusted to reflect estimated 2016 costs.

- Contingencies were calculated as percentages of the base capital cost based on the EPA feasibility study cost guidance, and adjusted as needed to account for Smoky Canyon Mine performing much of the work in-house.
    - The scoping activities were estimated as 10% of the based capital cost.
    - The bidding process was estimated as 0% assuming that Simplot will complete the work.
    - Project management was estimated as 2% of the base capital cost.
    - The remedial design was estimated as 4% of the base capital cost.
    - Construction management was estimated as 2% of the base capital cost.

Assumptions for the Annual O&M costs include the following:

- 40 pounds of nutrient amendments will be added to each of the 12 vessels six times per year starting in the spring once the snow has melted enough to access the system.
- 100 pounds of zero-valent iron will be added to each vessel once per year. This amendment may not be required on an annual basis, or at all depending on results, but is included for a more conservative O&M cost.
- Sampling will be performed by a two-person sampling team and will occur concurrent with other sampling activities (a separate mobilization will not be required).
- Nutrient addition will take 2 hours per visit.

D.4 Present Value Analysis

For the DS-7 treatment system, a cost estimate is developed in accordance with procedures in the G*uide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA, 2000). Costs are expressed in terms of 2016 dollars and are estimated based on actual costs in the pilot study and estimated costs to increase the system capacity. This analysis is used to evaluate the capital and O&M costs based on the present value. A present value analysis is used for expenditures which occur over time, with discounting to a common base year.

The total present value is equal to the full amount of all costs incurred through the end of the first year of operation, plus the series of expenditures in subsequent years reduced by the appropriate future value/present value discount factor. This analysis provides a single cost

representing an amount that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the treatment system over its planned life. The present value calculations are based on the following fundamental equation:

$$P = F / (1+i)^n$$

Where: P = present worth ($)
F = future worth ($)
i = discount rate (%)
n = time period (years)

A discount rate of 7 percent is used for the present worth calculations, consistent with EPA guidance and directives (EPA, 1988 and 2000). The discount rate represents the anticipated difference between the rate of inflation and investment return.

D.5 References

EPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. EPA/540/G-89/004. OSWER Directive 9355.3-01. October.

EPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002, OSWER 9355.0-75. July.

Fortier, Robert [editor], 2013. RSMeans Heavy Construction Cost Data 2014. 28th ed. Norwell, MA: Reed Construction Data, LLC.

Table D-1. DS-7 Cost Estimate

Capital Cost						
Material	**Size**	**Units**	**Quantity**	**Unit Cost**	**Subtotal**	**Notes:**
Influent Holding Tank	2000	gal	1	$ 2,239.00	$ 2,364.76	Approximated as a 2,000 gallon septic tank. Materials and labor, 33 36 13.13 0100, 2014 RSMeans Heavy Construction Cost Data (incrreased for estimated 2016 costs). This tank does not need a tratment residence time. It just provides collection capacity, storage, and settling prior to the treatment trains.
PVC Pipe	2 in DIA	linear ft	500	$ 1.51	$ 797.41	Feet of PVC pipe for collection and conveyance system. Material and labor, 33 11 13.25 2120, 2014 RSMeans Heavy Construction Cost Data (incrreased for estimated 2016 costs).
Influent/Effluent Manholes and Flumes	6	ft DIA	2	$ 13,000.00	$ 26,000.00	Existing fiberglass metering manways for flow monitoring and water sampling (Tracom Inc., Alpharetta, GA), quote from Vendor, not including freight, or taxes.
Polyethylene Reactor Vessel, w/ 5ft Access Manholes, and connection between tanks	2000	gal	12	$ 3,385.00	$ 42,120.00	Existing OcTanks (Darco Inc., Evergreen, CO) - From vendor, $2,900 per tank, $485 for Manhole, and $300 to connect the tanks in series.
Globe Valve	2	in DIA	7	$ 100.00	$ 700.00	Installed in inlet line, and at the junction to each tratment train to control flow; includes enclosure and reach rod for underground access
Floating Packing Rings	3.5 in DIA	cft	3240	$ 14.80	$ 47,952.00	3.5-inch Diameter Polyethylene Jaeger Pall Rings (Raschig USA Inc., Arlington, TX) quote from vendor.
Selenium Reducing Substrate	100	lbs	12	$ 500.00	$ 6,000.00	Substrate collected from streambed material and cultured by the University of Idaho lab for selenium reducing bacteria.
Equipment	**Hours**	**Miles**	**Number**	**Unit Cost**	**Subtotal**	**Notes:**
Flat bed truck*			6	$ 366.30	$ 2,197.80	Equipment and supply delivery, assume "Incl. Subs O&P", assume 3 ton flatbed truck, unit cost is daily
Excavator	120			$ 50.60	$ 6,413.06	1 cy excavator, diesel hydraulic, crawler mounted. 01 54 33 0150, 2014 RSMeans Heavy Construction Cost Data (incrreased for estimated 2016 costs)
Trenching Equipment	120			$ 93.25	$ 11,818.54	Wheel type, diesel, 6' deep, 20" wide. 01 54 33 5100, 2014 RSMeans Heavy Construction Cost Data (incrreased for estimated 2016 costs)
Dozer	120			$ 100.55	$ 12,743.75	Dozer, crawler, torque conv., diesel, 300 hp, 01 54 33 4310, 2014 RSMeans Heavy Construction Cost Data (incrreased for estimated 2016 costs)
Onsite Sanitation			3	$ 200.00	$ 600.00	Weekly rate for one standard portable toilet.
Construction Personnel	**Hours**			**Rate**	**Subtotal**	**Notes:**
Drivers	120			$ 57.30	$ 6,876.00	Assume "Incl. Subs O&P"
Equipment Operators	120			$ 74.15	$ 8,898.00	Assume "Incl. Subs O&P", assume medium equipment operator
Oversight	80			$ 100.00	$ 8,000.00	Average hourly rate.
Sampling	10			$ 100.00	$ 1,000.00	Average hourly rate.
			Capital Cost Subtotal:		**$ 184,481.33**	
Contingencies						
Scope				10%	$ 18,448.13	Based on EPA FS Cost Guidance, adjusted as needed to reflect work performed by Smoky Canyon Mine.
Bid				0%	$ -	Based on EPA FS Cost Guidance, adjusted as needed to reflect work performed by Smoky Canyon Mine.
Project Management				2%	$ 3,689.63	Based on EPA FS Cost Guidance, adjusted as needed to reflect work performed by Smoky Canyon Mine.
Remedial Design				4%	$ 7,379.25	Based on EPA FS Cost Guidance, adjusted as needed to reflect work performed by Smoky Canyon Mine.
Construction Management				2%	$ 3,689.63	Based on EPA FS Cost Guidance, adjusted as needed to reflect work performed by Smoky Canyon Mine.

Maintenance Costs Per Year						
Material	**Size**	**Units**	**Quantity**	**Unit Cost**	**Subtotal**	**Notes:**
Reactor Nutrients/Amendments	40	lbs	72	$15	$1,080	Molasses, sugar beet pulp, or other substances added to the reactor to feed the bacteria
Zero-Valent Iron	100	lbs	12	$2	$2,400	S-100 Micropowder (200 mesh/8.5 micron) (ISP Technologies, Inc. Redstone Arsenal, AL) - based on Hepure quote. Would not need to be added every year.
Sample Bottles	NA	NA	NA	NA	$0	Included in analysis price
Sample Filters	NA	# filters	15	$ 13.50	$ 202.50	Assume 1 filter for effluent and 1 filter for influent
Nitrile Gloves	NA	# gloves	15	$ 0.13	$ 1.88	Assume 1 person and 1 pair of gloves for both influent and effluent.
Preservative	NA	NA	NA	NA	$0	Included in analysis price
Equipment	**Days**	**Miles**	**Number**	**Unit Cost**	**Subtotal**	**Notes:**
Water Quality Meters	6	NA	1	$ 78.75	$ 472.50	Cost per day determined from current Geotech rental rates. Assume YSI 556 and Hach 2100Q
Field Vehicle for Sampling	6	2.5	1	$ 0.57	$ 8.50	Average of IRS mileage rates from 2013, 2014, and 2015. Assume 1 field vehicle per visit, mileage estimated from Google Earth
Peristaltic Pump	6	NA	1	$ 18.00	$ 108.00	Cost per day determined from current Geotech rental rates
Sampling Personnel	**Hours**	**Events**		**Rate**	**Subtotal**	**Notes:**
Simplot	2	11		$ 80.00	$1,760	Includes sampling events and adding ammendments.
Formation	2	6		$ 100.00	$1,200	Only includes sampling events.
Office Support	4	6		$ 80.00	$1,920	Only includes sampling events.
Laboratory			**Quantity**	**Unit Cost**	**Subtotal**	**Notes:**
Cooler Shipping					$0	Included in analysis price
Laboratory Analysis (per sample)	Long List		4	$ 598.45	$ 2,393.80	Current lab costs: long analyte list is $598.45 and short analyte list is $125.80
	Short List		8	$ 125.80	$ 1,006.40	
	Total				$ 3,400.20	
Data Validation					$ 3,000.00	Cost is assumed based on current estimated costs.
O&M Contingency 5%					$ 777.68	

Capital	$ 217,688	Assumes procurement and construction of a new system.
Annual O&M	$ 16,331	

Reference: Fortier, Robert (editor). RSMeans Heavy Construction Cost Data 2014. 28th ed. Norwell, MA: Reed Construction Data, LLC, 2013. Print.
2014 values were adjusted by 1.05617 to reflect 2016 costs.

TABLE D-2
PRESENT VALUE FOR DS-7 PILOT STUDY COST ESTIMATE
SMOKY CANYON MINE RI/FS

Item	Start Year [1]	End Year [2]	Estimated Cost [3]	Present Value [4]
Capital Costs - Year 0	0	1	$218,000	$210,869
Capital Costs - Year 10 (assumed at 80% of Year 0 capital costs)	10	11	$175,000	$86,051
Capital Costs - Year 20 (assumed at 80% of Year 0 capital costs)	20	21	$175,000	$43,744
O&M Costs - Years 1-30	1	30	$17,000	$210,954
Total Present Value				**$551,618**

Notes:

For Present Value calculations, the Discount Rate used is…. 7%

Costs and Present Value are based on "constant" or "real" 2016 dollars not adjusted for future inflation.

Unless identified separately, burden and profits are included in unit costs.

(1) Start Year is the year during which the capital construction or the O&M activities begin. Costs are assumed to be incurred on the first day of the year indicated.

(2) End Year is the year during which the capital construction or the O&M activities are completed. Costs are assumed to be incurred on the first day of the year indicated.

(3) Capital Costs are totals for the activity, not annualized; Annual O&M Costs are annualized to represent one year only.

(4) Present Value represents the total cost over the project life based on a discount rate applied to the estimated cost for each year after Year 0 (2016).